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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/661,035	09/13/2000	Tomohide Terashima	49657-801	8222

7590 03/13/2002

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EXAMINER

LOKE, STEVEN HO YIN

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 03/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/661,035

Applicant(s)

TERASHIMA, TOMOHIDE

Examiner

Steven Loke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4. 6) ☐ Other: \_\_\_\_\_

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1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

2. The disclosure is objected to because of the following informalities:

In page 6, lines 9-10, the first region has an impurity concentration of  $N_A$  and the fourth region has an impurity concentration of  $N_D$ . However, it is unclear why the specification discloses the N<sup>-</sup>-type epitaxial layer 2 (first region) has an impurity concentration of  $N_D$  and the P-type diffusion region 7 (fourth region) has an impurity concentration of  $N_A$ .

There is no depletion layer C (page 20, line 31) and depletion layer D (page 20, line 33) in fig. 28.

There is no depletion layer C (page 21, line 32) and depletion layer D (page 22, line 1) in fig. 29.

Appropriate correction is required.

3. Claims 4-11 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The written description never discloses the fourth region is electrically connected to the first electrode portion as claimed in claim 4.

Claim 1 discloses the fourth region having a depth changing as a position moves in a direction crossing a direction of flow of the current. The written description never discloses the fourth regions are also formed discretely, and the neighboring fourth

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regions are spaced from each other by a distance allowing connection between depletion layers extending from the neighboring fourth regions, respectively, in an on state in the same embodiment of claim 1 as claimed in claim 5.

The written description never discloses the fourth region having a depth changing as a position moves in a direction crossing a direction of flow of the current as claimed in claim 7.

The written description never discloses the fourth region is electrically connected to the second electrode portion as claimed in claim 9.

4. Claims 5, 6 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 5, line 2, "said fourth regions" has no antecedent basis.

In claims 6 and 11, it is unclear whether the first region has an impurity concentration of  $N_A$  or  $N_D$  and the fourth region has an impurity concentration of  $N_A$  or  $N_D$  because pages 6 and 10 of the applicant's written description disclose different impurity concentrations for the first and fourth regions.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitamura et al.

In regards to claim 1, Kitamura et al. discloses a semiconductor device in figs 6(a) and 6(b), comprising: a semiconductor substrate of a first conductivity type [1]; a first region [2] of a second conductivity type formed on and in direct contact with the semiconductor substrate; a second region [8] of the second conductivity type formed at and near the surface of the first region; a third region [3] of the first conductivity type formed at and near the surface of the first region, and surrounding the second region; a first electrode portion [7] formed on the surface of the third region located between the first and second regions with an insulating film [6] therebetween; a second electrode portion [12a] connected to the second region; a third electrode portion [13] connected to the first region and spaced by a distance from the third region; and a fourth region [4] of the first conductivity type formed at and near the surface of the first region between the third electrode portion and the third region.

It would have been obvious for the fourth region is formed by the impurity diffusion method because it is a widely used method to form semiconductor region in a semiconductor device.

Since the fourth region can be an impurity diffusion region, the fourth region would have a depth changing as a position moves in a direction crossing a direction of flow of the current.

In regards to claim 2, it would have been obvious for a fifth region of the first conductivity type surrounding the third electrode portion, and formed at and near the surface of the first region because IGBT is a widely used power device in the power device family.

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In regards to claim 3, it is inherent that the fourth region [4] is fixed to a constant potential because the source electrode [12a] is always connected to a constant source potential.

In regards to claim 4, Kitamura et al. further discloses the fourth region [4] is electrically connected to the second electrode portion [12a].

In regards to claim 5, it would have been obvious for the fourth regions are formed discretely, and the neighboring fourth regions are spaced from each other by a distance allowing connection between depletion layers extending from the neighboring fourth regions, respectively, in an on state because it depends on the design of the device.

In regards to claim 6, it would have been obvious to have the claimed formula as claimed in claim 6 because it depends on the design of the device.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Loke whose telephone number is (703) 308-4920. The examiner can normally be reached on 7:50 am to 5:20 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Application/Control Number: 09/661,035

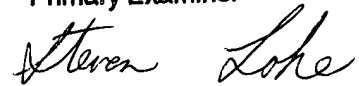
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March 10, 2002

Steven Loke  
Primary Examiner

A handwritten signature in cursive script that reads "Steven Loke". The signature is written in black ink and is positioned below the printed name and title.